AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 10/033,646

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1.   (*Currently Amended*) A method for making a remote copy between a first storage subsystem and a second storage subsystem which are connected to each other via a path, the first storage system connected to a first host, the method comprising ~~the steps of~~:

providing a first logical volume to the first storage subsystem and a second logical volume to the second storage subsystem[[,]];

copying the contents of the first logical volume to the second logical volume ~~being a copied logical volume of the first logical volume~~, the first logical volume and the second logical volume being in sync state;

making a third logical volume in the first storage subsystem and copying first data from the first logical volume to the third logical volume, the first logical volume and the third logical volume being in sync state;

making a fourth logical volume in the second storage subsystem and copying second data from the second logical volume to the fourth logical volume, the second logical volume and the fourth logical volume being in sync state, wherein the copying of the second data is performed after the copying the contents of the first logical volume to the second logical volume;

after the copying of the first data from the first logical volume to the third logical volume, breaking the sync state between the first logical volume and the third logical volume; [[and]]

2

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 10/033,646

<u>after copying of the second data from the second logical volume to the fourth logical</u>

<u>volume breaking the sync state</u> between the second logical volume and the fourth logical volume

based on a command;

after the copying of the first data from the first logical volume to the third logical volume

and after copying of the second data from the second logical volume to the fourth logical

volume, establishing a synchronization link between the fourth logical volume and the third

logical volume;

coupling a first auxiliary host to the third logical volume; and

enabling the first auxiliary host to perform operations on the third logical volume while

the first host continues operations on the first logical volume and while the first logical volume

and second logical volume continue in sync state.

2.   (*Previously Presented*) The method of claim 1, further comprising:

providing a second auxiliary host at the second storage subsystem, the second auxiliary

host having permissions to access the fourth logical volume; and

executing applications using the first auxiliary host, the second auxiliary host, the third

logical volume and the fourth logical volume.

3.   (*Previously Presented*) The method of claim 2, wherein

executing applications comprises performing data recovery testing

storing a test copy of data used by the first host on the third logical volume, and

forming a mirror image of data in the third logical volume on the fourth volume.

3

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 10/033,646

4. (*Previously Presented*) The method of claim 3, wherein

data recovery testing comprises:

simulating a disaster at the first auxiliary host; and

testing backup of information from the third logical volume to the fourth logical volume,

and recovery therefrom.

5. (*Previously Presented*) The method of claim 2, wherein

executing applications comprises performing data mining,

establishing on the third volume a data warehouse having a copy of on line transactions

processing (OLTP) data used by the first host, and

forming a mirror image of data in the third logical volume on the fourth volume.

6. (*Previously Presented*) The method of claim 5, wherein

data mining comprises:

establishing a data warehouse having a copy of on line transaction processing data at the

first auxiliary host;

performing data analyses on the data warehouse information, and

performing backups and/or recovery of the data warehouse information of the third

logical volume to the fourth logical volume.

7. (*Original*) The method of claim 1, further comprising:

determining if the sync state between the first logical volume and the second logical

volume is an asynchronous mirror, and if so:

4

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 10/033,646

inhibiting sending of further write data from the first storage subsystem to the second

storage subsystem;

recording incoming write data at the first storage subsystem; and

re-synchronizing the first logical volume and the second logical volume after breaking

the sync state between the second logical volume and the fourth logical volume.

8.   (*Original*) The method of claim 1, wherein

synchronizing the fourth logical volume with the third logical volume comprises:

issuing a command to form a mirror with a no copy option; and

creating a new copy management storage area for the mirror.

9-10.   (*Canceled*)

11.   (*Currently Amended*) An apparatus, comprising:

a first means for storing data;

a first host coupled to the first means for storing data;

a second means for storing data, being remotable from and a copy of content of the first

means for storing data, and being in a sync state with the first means for storing data;

a third means for storing data, co-located with and a copy of content of the first means for

storing data, and being in a sync state with the first means for storing data;

a fourth means for storing data, co-located with and a copy of content of the second

means for storing data, and being in a sync state with the second means for storing data, wherein

the sync state between the second means for storing data and the fourth means for storing data is

5

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 10/033,646

established after establishing of the sync state between the first means for storing data and the

second means for storing data;

a means for breaking the sync state between the first means for storing data and the third

means for storing data after establishing the sync state between the first means for storing data

and the third means for storing data and for breaking the sync state [[and]] between the second

means for storing data and the fourth means for storing data after establishing the sync state

between the first means for storing data and the third means for storing data;

a means for synchronizing the fourth means for storing data with the third means for

storing data after copying of content of the first means for storing data and the second means for

storing data and breaking the sync state; and

means for coupling a first auxiliary host to the third means for storing data; and

means for enabling the first auxiliary host to perform operations on the third means for

storing data while the first host continues operations on the first means for storing data and while

the first means for storing data and second means for storing data continue in sync state.

12.   (*Original*) The apparatus of claim 11,

further comprising:

a means for creating an atomic split command, the command comprising:

an identity of a first means for storing data to serve as a primary volume; and

an identity of a second means for storing data to serve as a secondary volume.

13.   (*Original*) The apparatus of claim 11,

6

further comprising:

a means for creating an atomic split command, the command comprising:

a first remote mirror, ORA_R1, comprised of the first means for storing data and the second means for storing data;

a second remote mirror, ORA_R2, comprised of the third means for storing data and the fourth means for storing data;

a first local mirror, ORA_L, comprised of the first means for storing data and the third means for storing data; and

a second local mirror, ORA_RL, comprised of the second means for storing data and the fourth means for storing data.

14.   (*Currently Amended*) A method, comprising:

establishing a first remote mirror between a first logical unit in a first storage system and a second logical unit in a second storage system, the second storage system being remotable from the first storage system;

enabling a first host to perform operations on the first logical unit;

establishing a first local mirror between the first logical unit and a third logical unit in the first storage system;

establishing a second local mirror between the second logical unit and a fourth logical unit in the second storage system, wherein the second local mirror is established after establishing of the first remote mirror;

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 10/033,646

after establishing the first local mirror and the second local mirror, splitting the first local

mirror and the second local mirror in response to a split command;

after establishing the first local mirror and the second local mirror, establishing a second

remote mirror between the third logical unit and the fourth logical unit; and

coupling a first auxiliary host to the third logical unit; and

enabling the first auxiliary host to perform operations on the third logical unit while the

first host continues operations on the first logical unit and while the first remote mirror remains

established.

15.   (*Original*) The method of claim 14, wherein

using the logical volumes of the first remote mirror for production processing; and

using the logical volumes of the second remote mirror for testing.

16.   (*Original*) The method of claim 14, wherein

using the logical volumes of the first remote mirror for on line transaction processing;

and

using the logical volumes of the second remote mirror for data mining.

17.   (*Original*) The method of claim 14, wherein

establishing a second remote mirror between the third logical unit and the fourth logical

unit comprises:

issuing a create mirror command with a no copy option; and

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 10/033,646

creating a new copy management information store for managing mirroring between the

third logical unit and the fourth logical unit.

18.   *(Original)* The method of claim 14, wherein

splitting further comprises:

determining whether the first remote mirror is asynchronous, and if so:

copying all pending information to the second storage system.

19.   *(Original)* A plurality of remote copy mirrors formed according to the method of

claim 1.

20.   *(Original)* A plurality of remote copy mirrors formed according to the method of

claim 14.

21.   *(Currently Amended)* A computer program product, comprising:

code for establishing a first remote mirror between a first logical unit in a first storage

system and a second logical unit in a second storage system, the second storage system being

remotable from the first storage system;

code for enabling a first host to perform operations on the first logical unit;

code for establishing a first local mirror between the first logical unit and a third logical

unit in the first storage system;

AMENDMENT UNDER 37 C.F.R. § 1.111
U.S. Application No.: 10/033,646

code for establishing a second local mirror between the second logical unit and a fourth

logical unit in the second storage system, wherein the second local mirror is established after

establishing of the first remote mirror;

code for splitting the first local mirror and the second local mirror in response to a split

command, after establishing the first local mirror and the second local mirror;

code for establishing a second remote mirror between the third logical unit and the fourth

logical unit, after establishing the first local mirror and the second local mirror;

code for coupling a first auxiliary host to the third logical unit;

code for enabling the first auxiliary host to perform operations on the third logical unit

while the first host continues operations on the first logical unit and while the first remote mirror

remains established; and

a computer readable storage medium for holding the codes.

10